

NOTES ON THE BEHAVIOR AND TAXONOMY OF
MEGACHILE (XEROMEGACHILE) BRIMLEYI MITCHELL
AND ITS PROBABLE CLEPTOPARASITE,
COELIOXYS (XEROCOELIOXYS) GALACTIAE MITCHELL
(HYMENOPTERA: MEGACHILIDAE)

KARL V. KROMBEIN AND BETH B. NORDEN

Department of Entomology, Smithsonian Institution, Washington, D.C. 20560.

Abstract.—*Megachile brimleyi* Mitchell and its probable cleptoparasite, *Coelioxys galactiae* Mitchell, were studied in south central Florida during August, 1992. Foraging adults were collected along with other bees and wasps attracted to the flowers of *Galactia regularis* and *Tephrosia chrysophila*. Excavation of two active *M. brimleyi* nests provided details of nest structure and cell construction. Difficulties in keying both female and male *C. galactiae* are discussed, and revised couplets are provided for females.

Key Words: *Megachile*, nest, *Coelioxys*, cleptoparasite

A brief visit to the Archbold Biological Station (ABS), Highlands County, Florida, provided an opportunity to observe and collect *Megachile brimleyi* Mitchell and its probable cleptoparasite, *Coelioxys galactiae* Mitchell. Bees were collected 14-16 August 1992, and two active nests were dug up on the 15th. Plants visited by the bees were collected and pressed. Voucher insect and plant specimens are deposited in the National Museum of Natural History, Smithsonian Institution (USNM) and the Archbold Biological Station (ABS).

STUDY SITE

Bees were studied along a firebreak cutting through sand pine scrub near the southern end of the Lake Wales Ridge. This narrow, north-south ridge of sandy uplands is part of the ancient line of dunes that remained above water during Pleistocene inundations. The substrate is composed of loose, small grained, white quartz sand and particles of charred organic material, the residue from repeated scrub fires. The ster-

ile, sandy soil is well drained but moist below the surface.

MATERIALS AND METHODS

Adult bees were collected on plants, and observed as they excavated nests. Plant specimens were put in plastic bags and transferred later to a plant press. The two bee nests were examined after blowing plaster-of-Paris into the nest openings to trace their paths, and then carefully removing sand grains from around the tunnels with a tablespoon, penknife, and small paint brush. Nest contents were preserved in Kahle's solution, then examined and measured in the laboratory. The bees were identified using Mitchell (1962, 1973) and by comparison with specimens identified by him in USNM.

RESULTS AND DISCUSSION

Nest architecture.—Nesting data have been reported for only one other species of the subgenus *Xeromegachile*, *M. rubi* Mitchell in North Carolina (Sivik 1954) and Georgia (Eickwort et al. 1981). We found

Table 1. Wasp and bee visitors to flowers of *Galactia regularis*.

Tiphidae

Tiphia intermedia Malloch: ♂.

Larridae

Trypoxylon johannis Richards: ♂.

Philanthidae

Cerceris tolteca Saussure: ♂.

Halictidae

Nomia maneei Cockerell: ♀ without pollen.*Augochloropsis sumptuosa* (Smith): ♀ without pollen.

Megachilidae

Anthidium maculifrons Smith: ♀ without pollen.*Anthidiellum notatum rufimaculatum* Schwarz: ♂.*Megachile* (*Litomegachile*) *brevis pseudobrevis* Mitchell: ♂, ♀ with abundant *G. regularis* pollen on scopa.*Megachile* (*Litomegachile*) *mendica mendica* Cresson: 3 ♀, two with abundant *G. regularis* pollen on scopa, one with no pollen.*Megachile* (*Xeromegachile*) *brimleyi* Mitchell: ♂, 2 ♀ without pollen.*Megachile* (*Xeromegachile*) *integra* Cresson: 5 ♂, 2 ♀, one female with *G. regularis* pollen on the scopa, one without.*Coelioxys* (*Xerocoelioxys*) *galactiae* Mitchell: ♀.

M. brimleyi females digging their own nests in sandy soil exposed to full sunlight, similarly to *M. rubi*. *M. brimleyi* tunnels were in level ground, and penetrated the substrate at an angle of 45°. The entrances of the two *M. brimleyi* nests were 8.5 and 10.0 mm in diameter. The females used their hindlegs to kick the sand grains 3–6 cm from the nest entrances, thus forming a semicircular spoil heap. Both tunnels were 10 cm long, and ended in an enlarged chamber, a single cell. It was our impression that these nests, the only two found in the area, were newly initiated, and eventually might have contained more cells. Sivik reported that nests of *M. rubi* had 1–3 cells in a linear series, while 1–4 cells were reported by Eickwort et al.

The cell of one *M. brimleyi* nest was lined with 11 leaf pieces cut from *Galactia regularis*. Eight of the pieces were ca 9 mm wide and 15.5 mm long with rounded edges. Three subcircular pieces, used to form the cell base, were ca 7 mm wide and 8 mm long. The leaf cuttings were weakly cemented together. The cell was ca 17 mm

long, and it had not been provisioned or capped. Sivik found that *M. rubi* formed cells of similar size from leaves of *Betula lenta*, and capped the cells with 4–5 leaf pieces. Eickwort et al. reported ca 14 leaf pieces used to form a cell, and ca 3 to cap it.

Plant and insect associations.—Two leguminous plants, the pink-flowered *Galactia regularis*, and the white-flowered, prostrate *Tephrosia chrysophylla*, attracted a variety of wasps and bees (Tables 1, 2). Both sexes of *Megachile brimleyi* visited flowers of both plants, and one nesting female carried *G. regularis* pollen on the scopa. Interestingly, females of *Coelioxys galactiae* also visited both plants. Behavioral data strongly suggest that *C. galactiae* is a cleptoparasite of *M. brimleyi*. We watched two females of *C. galactiae* each following a *M. brimleyi* female, and then entering her nest after her. We also observed other *Coelioxys* females, presumably *galactiae*, following *M. brimleyi* females as they flew over the sand and among the plants.

Megachile integra Cresson is the only oth-

Table 2. Bee visitors to flowers of *Tephrosia chrysophylla*. (No wasps were noted on this plant.)

Halictidae	
<i>Nomia maneci</i> Cockerell: 3 ♀, one with abundant	
<i>T. chrysophylla</i> pollen on the scopa, others with	
lesser amounts.	
Megachilidae	
<i>Megachile (Xeromegachile) brimleyi</i> Mitchell: ♂, ♀	
without pollen.	
<i>Coelioxys (Xerocoelioxys) galactiae</i> Mitchell: 2 ♀.	

er *Xeromegachile* that we collected at the study site. Both sexes were collected on *Galactia* flowers, but only one female had numerous pollen grains of *Galactia* on the scopa. Nothing is known of the nesting habits of *M. integra*.

Coelioxys galactiae Mitchell

Fig. 2

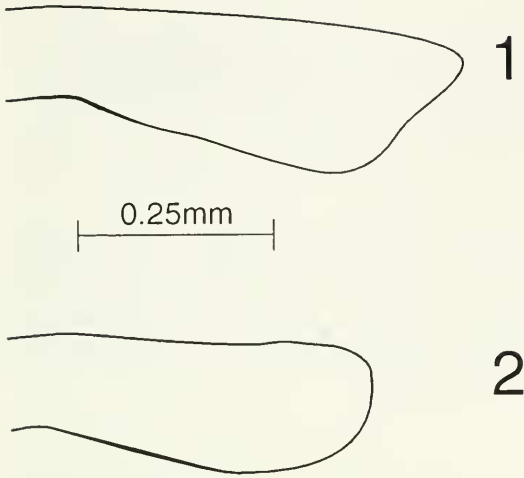
The syntype series of *C. galactiae* is from North Carolina, Illinois, and northern Florida (Clay and Levy counties). Both sexes have light red legs except for the coxae. However, nine females and four males from ABS in south central Florida have the legs predominantly black or dark brown except for two females which have reddish brown tibiae and tarsi. This is a striking reversal of the normal coloration of aculeate Hymenoptera in which there is an increasing amount of red in more southern populations.

Mitchell (1962) separated females of three species of *Coelioxys*, *galactiae* Mitchell, *sodalis* Cresson and *immaculata* Cockerell, from the other eastern species of the genus by the similarly shaped sixth sternum. It is not notched laterally but is incurved apically to form a short, acute, subtriangular projection. Females of *C. galactiae* from ABS do not key out properly in Mitchell (1962, couplets 13–14). In a series of nine females from ABS the tibiae and tarsi are predominantly black or dark brown in seven, reddish brown in two.

We examined the series of these three species in the National Museum of Natural History (USNM), and the syntypes of *C. galactiae* in the collection at North Carolina State University. We believe that the following key will distinguish the three taxa with greater certainty. It should replace couplets 13 and 14 in Mitchell (1962).

- 13. Carina on pronotal lobe strongly raised, lamellate; vestiture of head short, appressed, dense on clypeus and lower front; thorax with areas of short, dense, appressed white setae—narrow bands anteriorly and posteriorly on scutum, narrow anterior band on scutellum sometimes interrupted medially and the posterior declivous surface, small median patch on metanotum, narrow anterior and posterior bands on mesopleuron; clypeus slightly convex, not elevated above level of face *C. galactiae* Mitchell
- Carina on pronotal lobe not raised, obscured by vestiture in *C. sodalis*; vestiture of head appressed and not so dense on clypeus and supraclypeal area only; thorax either without appressed setae, or with such areas greatly reduced in extent; clypeus slightly convex or elevated 14
- 14. Clypeus slightly convex, not elevated above level of face; vestiture of head, except clypeus and supraclypeal area, and thorax long, erect and silvery *C. sodalis* Cresson
- Clypeus more strongly convex, elevated above level of face as viewed in profile; vestiture appressed on clypeus and supraclypeal area, suberect laterally along orbit and erect on upper front, shorter than in *C. sodalis*; bands of appressed, decumbent hair on scutum absent anteriorly, evanescent laterally and posteriorly; appressed setae on scutellum forming a narrower anterior band than in *C. galactiae*, sparser on posterior declivous surface; metanotum with longer, suberect, evenly distributed setae; mesopleuron with narrower anterior and posterior bands of longer, suberect setae *C. immaculata* Cockerell

Floridian males of *C. galactiae* key to *C. boharti* Mitchell (Mitchell 1962) because of their dark legs. We examined the unique holotype of *C. boharti* (USNM), and find that it is readily distinguished by the abundant, broad, short setae on the mesopleural disk, 2–3 times as long as wide, the more



Figs. 1, 2. *Coelioxys* species, apical half of paramere, lateral aspect, ventral margin at bottom. 1, *C. boharti* Mitchell; 2, *C. galactiae* Mitchell.

infuscated wings, and the paramere (Fig. 1) which in lateral view widens gradually for most of the apical half, and then tapers obliquely to the narrowly rounded apex. In *C. galactiae* the discal setae of the mesopleuron are narrower, mostly more than four times as long as wide, and the apical half of the paramere (Fig. 2), in lateral view, widens gradually over most of its length with the apex broadly rounded. The discal vestiture of the mesopleuron is variable in width in specimens from ABS, but it is never as broad and short as in *C. boharti*.

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